NOTES ON PODOSTEMACEAE

FOR THE REVISION OF THE *FLORA OF WEST TROPICAL AFRICA*

G. TAYLOR

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NOTES ON PODOSTEMACEAE FOR THE REVISION OF THE *FLORA OF WEST TROPICAL AFRICA*

By G. TAYLOR

THIS account contains descriptions of the new genera and species which will be included in the revised edition of Hutchinson and Dalziel's *Flora of West Tropical Africa*, also notes on some other species of the family.

The treatment of the *Podostemaceae* in the first part of the *Flora of West Tropical Africa*, published in 1927, recognized only two genera, each with one species, but in the intervening years our knowledge of the family has grown astonishingly, and now, as the result of recent collecting in British and French-controlled territory, the representation of the family in the new edition will be increased to 6 genera, with a total of 18 species.

It is evident that the highest density of genera and species is in the rain-forest countries around the Gulf of Guinea and, as the available specimens indicate that there is a high degree of local endemism in the family, there is little doubt that the rivers of West Africa will yet yield a rewarding harvest of new species.

Some species are extremely variable, and seasonal variations and abrasion in the austere habitat obscure and sometimes destroy differential characters. It is possible that modifications or states of one plant have been distinguished as species, and when further material at all seasons is obtained, some adjustment of the present classification may be necessary.

A monographic study of the African *Podostemaceae* is in preparation, and in that work discussion of generic limits and affinities will be developed.

In preparing this account I have had the advantage of the loan of material from the Paris Museum of Natural History, from Professor H. des Abbayes of the University of Rennes, from the Berlin Botanical Garden, and from the Botanic Museum and Herbarium, Utrecht. Finally, the splendid collections of herbarium and spirit specimens made by Mr. R. W. J. Keay and his associates in Nigeria and the British Cameroons, which are preserved at Kew, have been placed freely at my disposal. I wish to thank the Directors of these institutions and those who have allowed me to examine the specimens and so prepare such a full treatment of the family for the forthcoming volume.

Pohliella flabellata G. Tayl., sp. nov. (Fig. 1).

Herba caulescens usque ad 21 cm. longa, thallo radicali saxis adhaerens; caules fluitantes pseudo-dichotomi, paullum compressi. *Folia* fluitantia, ambitu flabellata, pluries dichotoma, usque ad 3 cm. longa et 2 cm. lata, basi vaginata, segmentis primariis anguste linearibus, laciniis ultimis capillaribus. *Spathellae* ex thallo radicali

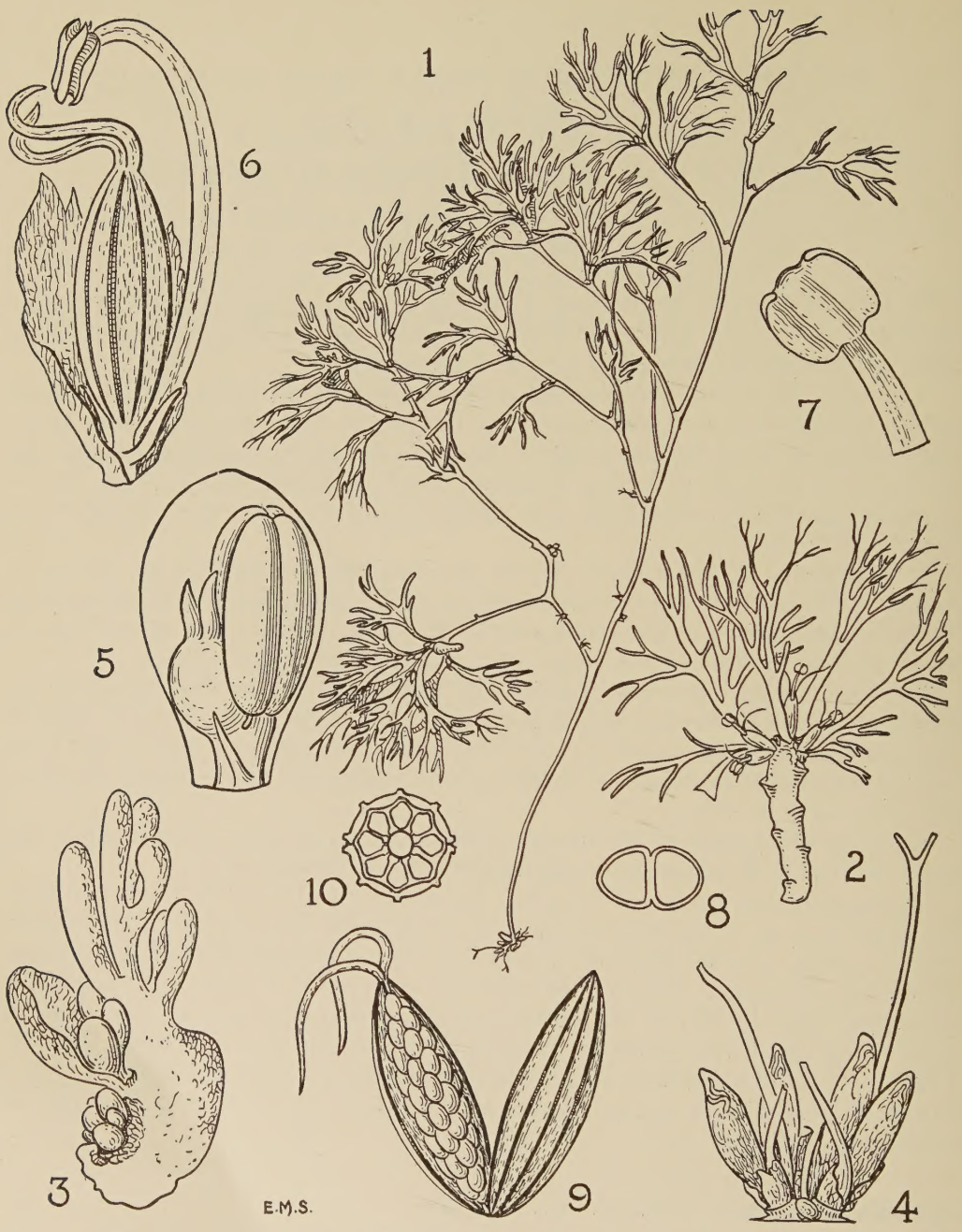

FIG. 1. *Pohliella flabellata* G. Tayl.

1. Plant showing habit (×⅔). 2. Flowering shoot (×2). 3. Portion of thallus with young shoots and spathellae (×20). 4. Group of spathellae (×20). 5. Flower within unruptured spathella (×40). 6. Mature flower (×16). 7. Anther (×30). 8. Pollen-grain (×300). 9. Dehisced capsule (×16). 10. Section of ovary (diagrammatic).

emergentes etiam ramulorum floriferorum apicem versus in foliorum axillis gestatae, anguste ellipsoideae, c. 1 mm. longae. *Flos* in spathella brevissime pedicellatus, erectus. *Tepala* 2, subulata, c. 0·3 mm. longa. *Stamen* 1; filamentum demum 4·5 mm. longum; anthera c. 0·5–0·75 mm. longa et 0·5 mm. lata, in spathella accumbens; pollen bicellulare. *Ovarium* primum globosum, deinde ellipsoideum, c. 3·5 mm. longum, 8-costatum costis 2 commissuralibus duplicibus; gynophorium 0·25 mm. longum; stigmata 2, subulato-filiformia, c. 2 mm. longa, persistentia. *Capsula* ellipsoidea, bivalvis, c. 3·5 mm. longa et 1 mm. lata; valvae aequales, praeter costas marginales 3-costatae.

NIGERIA. Ogoja Province: by the Aboabam–Boje path crossing the Afi River, aquatic herb forming dense masses on rocks below water; thallus green, blotched crimson; 13 Dec. 1950, *Keay FHI. 28240* (Herb. Kew, holotype; Herb. Brit. Mus.).

Apart from differences in habit and shape of the stigmas, I am not satisfied that the key characters used by Engler to distinguish *Pohliella* from *Saxicolella* are sufficiently diagnostic. The number of ribs on the capsule—whether 6 or 10—is probably unreliable in this group, and it is almost impossible, without careful microtome sections of young flower-buds, to decide whether the ovary has one or two loculi. I have placed this species in *Pohliella* on account of its subulate stigmas and repeatedly dichotomously branched leaves. It deviates from the generic definition in having, as far as I have been able to ascertain, a unilocular ovary. I have described the capsule of *P. flabellata* as having 8 ribs, of which the 2 commissural ribs, in the plane of dehiscence, are double, but judging from the description and figure given by Engler (in Engl. & Drude, Veg. Erde ix, 3, 1: 271, fig. 177 (1915) as *Inversodicraea laciniata* Engl.), he would consider the capsule to be 10-ribbed.

Butumia G. Tayl., gen. nov. inter genera tribus *Podostemearum*[1] gemmis ad marginem thalli angusti ramosi dispositis, foliis rosulatis, floribus in spathella erectis, stigmatibus complanatis distinctum.

Spathellae ovoideae, minute apiculatae. *Flos* in spathella breviter pedicellatus, erectus. *Tepala* 2, minuta. *Stamen* 1, in spathella accumbens; pollen bicellulare. *Ovarium* ellipsoideum, 8-costatum, costis 2 commissuralibus duplicibus; gynophorium brevissimum; stigmata 2, complanata, ambitu elliptica, divergentia, persistentia. *Capsula* late ellipsoidea, bivalvis; valvae aequales, praeter costas marginales 3-costatae.

Herba pusilla acaulis; thallus radicalis angustus, ramosus, margine utrinque gemmas minimas gerens; gemmae sessiles, 1-florae. *Folia* rosulata, sessilia, subulata, basi leviter amplexicaulia, interiora florem subtendentia, minute stipulata.

Species 1, in west tropical Africa. Type: *B. marginalis* G. Tayl.

Butumia marginalis G. Tayl., sp. nov. (Fig. 2).

Thallus c. 1·5 mm. latus. *Gemmae* sub anthesin usque ad 1·25 mm. altae. *Folia* c. 1 mm. longa. *Spathellae* 1 mm. longae. *Pedicellus* demum c. 1 mm. longus. *Staminis* filamentum demum c. 1·2 mm. longum; anthera c. 0·5 mm. longa. *Ovarium* 1 mm. longum et 0·75 mm. latum.

[1] PODOSTEMEAE = *Eupodostemeae* Benth. in Benth. & Hook., Gen. Pl. iii: 107 (1862), *nom. illegit.*

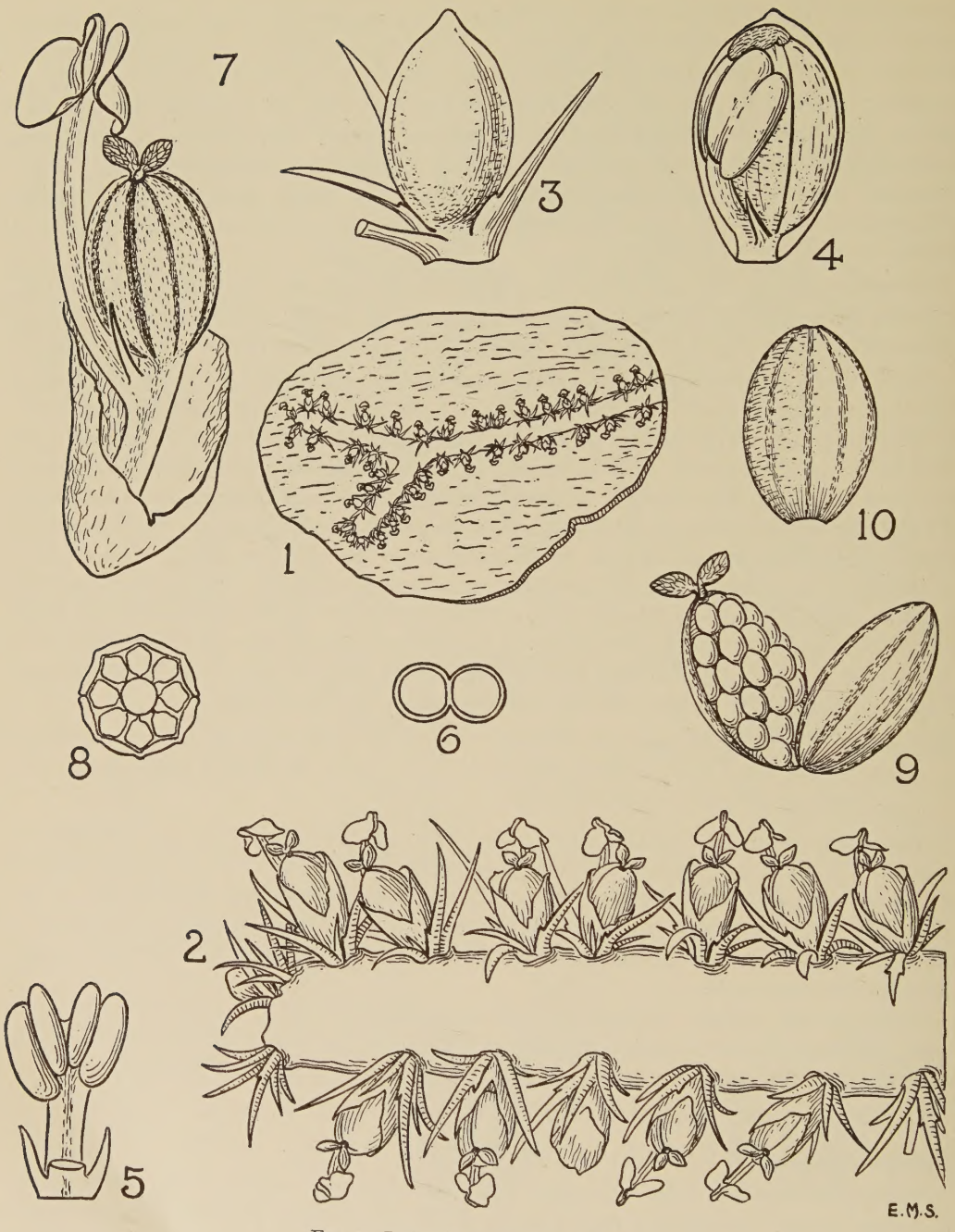

FIG. 2. *Butumia marginalis* G. Tayl.

1. Habit on rock (×2). 2. Portion of thallus with flowers (×10). 3. Young flowering shoot (×28). 4. Flower within unruptured spathella (×28). 5. Stamen and tepals (×28). 6. Pollen-grain (×350). 7. Mature flower (×28). 8. Section of ovary (diagrammatic). 9. Dehisced capsule (×28). 10. Capsule valve (×28).

NIGERIA. Ogoja Province: River Butum, Utanga, about 3 km. north of Bagga, on smooth granite rocks, just below, at, and just above water-level in fast-flowing stream; moss-like plant in small rosettes with reddish central thallus, often several connected by a red thread-like 'stolon'; 25 Dec. 1948, *Keay, Savory & Russell FHI. 25152* (Herb. Kew, holotype; Herb. Brit. Mus.).

This plant cannot suitably be referred to a described genus and yet it is not distinguishable by any prominent diagnostic feature but rather by a combination of characters. The species is strikingly similar in habit to *Inversodicraea minima* Engl. from South Cameroons, but it differs basically in having the flower erect within the spathella. The one-flowered shoots (with entire rosulate leaves) arranged along the margin of the thallus, the flowers erect within the spathella and with a single stamen, the short pedicel and the complanate stigmas, collectively justify generic rank. Amongst African genera the plant is most closely related to *Saxicolella* and *Pohliella*, in each of which the flower is unistaminate and erect within the spathella, but it differs from these genera in having entire rosulate leaves, much more shortly pedicellate flowers and complanate stigmas. *Butumia* may also be related to *Polypleurella*, a monotypic genus in Siam. The two genera have one-flowered shoots borne at the margins of a branched hepatic-like thallus, but in *Polypleurella* the leaves are distichous, the subulate tepals equal the androecium, and the styles are subulate.

The genus is named after the river in which it is found.

Letestuella G. Tayl., gen. nov. inter genera tribus *Podostemearum* floribus in spathella inversis, capsulis globosis laevibus (haud costatis) distinctum.

Spathellae fusiformi-ellipsoideae, basi breviter vel longe stipitatae. *Flos* in spathella pedicellatus, erectus. *Tepala* 2, minuta. *Stamina* 1–2, in spathella accumbentia; pollen unicellulare. *Ovarium* globosum, praeter sulcum commissuralem laeve; gynophorium brevissimum; stigmata 2, clavata, in spathella antheras versus deflexa. *Capsula* globosa, bivalvis; valvae aequales, ecostatae, nitidae.

Herbae caulescentes, ramosae. *Folia* integra vel plerumque 1–3-bifida, laciniis anguste linearibus, basi leviter amplexicaulia, minute stipulata vel exstipulata.

Species 2, in west tropical Africa. Type: *L. tisserantii* G. Tayl.

In naming this genus *Letestuella* I wish to commemorate M. Georges Le Testu who has made extensive botanical explorations in French Equatorial Africa and whose large collections of *Podostemaceae* include a number of new species yet to be described.

Letestuella tisserantii G. Tayl., sp. nov. (Fig. 3).

Herba longitudine 5 cm. attingens. *Folia* disticha, in caulis parte inferiori cataphyllaria, minuta, amplexicaulia; folia superiora 1–3-bifida, usque ad 4 cm. longa. *Spathellae* c. 3·5 mm. longae, post anthesin campanulatae apice laceratae interdum revolutae. *Pedicellus* c. 2 mm. (post anthesin usque ad 6·5 mm.) longus. *Stamina* 1 (tumque filamento c. 1·2 mm. longo) vel 2 (tumque andropodio 1·4 mm. longo filamentis brevissimis). *Ovarium* c. 1·2 mm. diametro.

UBANGI-SHARI. Rocks in the River Baedou, Zubingui, 29 Nov. 1927, *Tisserant* in

FIG. 3. *Letestuella tisserantii* G. Tayl.

1. Plant showing habit (×3). 2, 3. Flowering shoots (×3). 4. Node (×8). 5. Spathella (×16). 6. Flower within unruptured spathella (×16). 7, 8, 9, 10. Flowers removed from spathellae (×16). 11. Receptacle (×16). 12, 13. Stamens (×16). 14. Pollen-grain (×660). 15. Stigmas (×16). 16. Infructescence (×8).

Herb. Le Testu 1769 (Herb. Le Testu, holotype; Herb. Brit. Mus.); on rocks on an island in the River Baedou, 25 km. south of Ippy, 29 Nov. 1927, *Tisserant* in *Herb. Le Testu 2352* (Herb. Le Testu; Herb. Brit. Mus.).

Letestuella chevalieri G. Tayl., sp. nov.

Leiothylax sphaerocarpa[1] sensu A. Chev., Fl. Viv. Afr. Occ. Franç. i: 295 (1938) pro parte; non Engl.

Herba tenuiter caulescens, ramosa, ut videtur 3·5 cm. attingens. *Folia* anguste linearia, integra vel breviter bifida, laciniis anguste linearibus, usque ad 2 cm. longa, basi leviter dilatata et vaginata. *Spathellae* ad caulium apices dispositae, in fructu longe stipitatae stipite usque ad 1 cm. longo. *Pedicellus* in fructu c. 1 cm. longus. *Tepala* minutissima, subulata. *Stamina* 2; filamenta cum andropodio persistenti c. 1·5 mm. longa. *Gynophorium* 0·5 mm. longum. *Ovarium* in spathella verisimiliter erectum. *Capsula* globosa, laevis, nitida, bivalvis, 1 mm. diametro; stigmata decidua; valvae aequales, ecostatae.

French Sudan. Falls of the Niger, 23 Mar. 1932, *Chevalier 44058 bis* (Herb. Paris, holotype).

The material of this species which I have examined is rather fragmentary and too mature for adequate description of the spathellae and flower structure. The floral details given have been derived from persistent remnants on the few fruiting specimens available and also from two somewhat mutilated spathellae which had failed to develop properly. On that account they may have been slightly abnormal, but in each the ovary appeared to be erect and the spathella only recently ruptured. This observation requires to be confirmed from examination of younger material, but, for the present, it is desirable to recognize the plant as a second species of *Letestuella*, with which it agrees in all other important particulars.

Stonesia G. Tayl., gen. nov. inter genera tribus *Podostemearum* staminodio inter filamenta posito, capsula leviter compressa, 12–18-costata, eis ad commissuras approximatis brevioribus capsulae extremitates non attingentibus valde distinctum.

Spathellae subobovoideae vel ellipsoideae secus caules elongatos dispositae, atque nonnunquam in thallo radicali sessiles tumque interdum a dorso complanatae sublenticulares thallo accumbentes. *Flos* in spathella inversus, pedicello brevior. *Tepala* 2, filiformia. *Stamina* 2, andropodio filamenta subaequanti; staminodium subulatum inter filamenta positum. *Ovarium* ellipsoideum vel subglobosum, multicostatum; gynophorium brevissimum vel subnullum; stigmata 2, brevissima vel filiformia, divergentia. *Capsula* late ellipsoidea vel subglobosa, leviter compressa,

[1] I have examined material cited by Engler (*Ledermann 2894* in the Berlin Herbarium) when he originally described *Leiothylax sphaerocarpa*, and the flower within the spathella is inverted and there is a single stamen. Furthermore, the globose capsule has broad but inconspicuous longitudinal bands. These characters indicate that the species should be referred to *Sphaerothylax*, thus:

Sphaerothylax sphaerocarpa (Engl.) G. Tayl., comb. nov.
Leiocarpodicraea sphaerocarpa Engl. in Engl. & Drude, Veg. Erde ix, 3, 1:275 (1915).
Leiothylax sphaerocarpa (Engl.) Engl. in Engl. & Prantl, Nat. Pflanzenfam., ed. 2, xviiia: 58 (1930).

multicostata, bivalvis; costis 12–18, eis ad commissuras approximatis brevioribus capsulae extremitates non attingentibus; valvae subaequales, 6–9-costatae, altera persistens, altera decidua.

Herbae thalloideae et caulescentes; caules elongati, ramosi. *Folia* raro integra, plerumque bifida ad multifida, segmentis linearibus.

Species 3, in west tropical Africa. Type: *S. heterospathella* G. Tayl.

Stonesia is at once distinguished from all other African *Podostemaceae* by three well-defined floral characters: (i) the presence of a staminode inserted between the two functional stamens (this is a feature of a number of extra-African species, and it is found in *Podostemum ceratophyllum* Michx., a native of temperate North America and the type of the family); (ii) the number of ribs on the slightly compressed capsule varies from 12 to 18 (in other African genera it is not known to exceed 10); (iii) the ribs nearest to the commissures do not run the length of the capsule along the commissures but begin on the commissure above the base and, curving parallel to the other ribs, rejoin the commissure below the apex. The type species, *S. heterospathella*, also possesses unusual features in having dimorphic spathellae of which each sort is of a type apparently unknown in other genera. This remarkable dimorphism may not be exceptional, and clearly shows the need for thorough and knowledgeable collecting of these plants, otherwise unnecessary duplication of species may result from the description of different parts of the same plant.

This distinct genus of three species is decidedly circumscribed in its present known distribution, and is confined to a small region of French Guinea where two of the species apparently grow in association.

In naming this genus *Stonesia* I wish to express my deep gratitude to Miss Margaret Stones, whose beautiful illustrations, completed with infinite care and patience, have been of the utmost value in elucidating the microscopical floral structure of these remarkable plants.

Stonesia heterospathella G. Tayl., sp. nov. (Figs. 4 and 5).

Dicraeia[1] *garrettii* sensu A. Chev., Explor. Bot. Afr. Occ. Franç.: 539 (1920).—Hutch. & Dalz., Fl. W. Trop. Afr. i: 108 (1927) pro parte; non C. H. Wright.

Dicraeanthus parmelioides A. Chev., Fl. Viv. Afr. Occ. Franç. i: 294, fig. 43B (1938), *nom. nud.* (descr. gall. tantum).

Herba thallo radicali saxis adhaerens; caules elongati, steriles vel floriferi, pluries dichotomi, ex thallo emergentes, usque ad 12 cm. longi. *Folia* laciniata; laciniae superiores demum basibus persistentibus segmentorum ultimorum munitae. *Spathellae* dimorphae; eae ex thallo emergentes solitariae, unibracteatae, difformes, a dorso complanatae, sublenticulares et thallo accumbentes, margine incrassata cartilaginea circumdatae alibi membranaceae, demum crateriformes margine involutae, bractea

[1] I have adopted the original spelling of Thouars (Gen. Nov. Madag.: 2 (1806)). Steudel, in the second edition of his *Nomenclator Botanicus* (i: 505 (1840)) reduced *Dicraeia* to *Lacis* Schreb. under the specific name *L. Dicraea* Steud., and in doing so altered the spelling to *Dicraea*.

Tulasne, in his *Podostemacearum Synopsis Monographica* (in Ann. Sci. Nat., Sér. 3, Bot. xi: 100 (1849)), accepted the spelling *Dicraea* which he considered preferable on account of the derivation from δίκραιος (forked, cleft). Thouars, however, was quite at liberty to choose the spelling *Dicraeia*, though it may be the poorer form philologically. Technically the name *Dicraeia* is an illegitimate substitute for *Podostemum* Michx. which is cited by Thouars.

FIG. 4. *Stonesia heterospathella* G. Tayl.

1. Plant showing habit (×1½). 2. Fruiting specimen (×1½). 3. Unruptured spathella on the thallus (×20). 4. Vertical section of spathella on thallus (×20). 5. Ventral view of spathella on thallus (×20). 6. Dorsal view of spathella on thallus (×20). 7. Flower emerging from spathella (×20). 8. Mature flower (×20). 9. Anther (×40). 10. Pollen-grain (×400). 11. Section of ovary (diagrammatic). 12. Young fruit (×40). 13. Persistent capsule valve (×40). 14. Seed (×40).

squamiformi concava persistenti juxta spathellae basin posita, c. 2 mm. longae; eae in caulibus elongatis axillares, juventute glandiformes, involucellatae, haud compressae, basi bibracteatae (bracteis anguste linearibus, c. 1 mm. longis, mox deciduis), c. 1·5 mm. longae. *Flos* per anthesin 1·5 mm. altus; pedicellus c. 1·5 mm. longus, apice curvatus, demum erectus et usque ad 4 mm. longus. *Tepala* 0·5 mm. longa. *Staminum* filamenta 0·3 mm. longa; antherae 0·4 mm. longae et 0·4 mm. latae; pollen bicellulare; staminodium 0·3 mm. longum; andropodium brevissimum. *Ovarium* late ellipsoideum, 1 mm. longum, brevissime stipitatum; stigmata anguste filiformia, 0·5 mm. longa, divergentia. *Capsula* subglobosa vel late ellipsoidea, costis 12–18; valvae 6–8-costatae, altera persistens in sicco fortiter inflexa.

French Guinea. High plateau between Ditinn and Diaguissa, April 1905, *Chevalier 12842* (Herb. Paris; Herb. Brit. Mus.); on rocks lapped by water and in spray in a natural basin at the foot of the great falls, Ditinn (circle of Dalaba), about 720 m., 14 Nov. 1948, *des Abbayes 877/1948* (Herb. Brit. Mus., holotype; Herb. Univ. Renn.; Herb. Utrecht); same locality and date, *des Abbayes 887/1948* (Herb. Brit. Mus.; Herb. Univ. Renn.); rocks in the current immediately below the great fall, falls of the Kinkon, Pita, 880 m., 22 Nov. 1948, *des Abbayes 897 bis/1948* (Herb. Brit. Mus.; Herb. Univ. Renn.; Herb. Utrecht); same locality and date, on flat rocks in the current, in shallow water or exposed at time of flowering, *des Abbayes s.n.* (Herb. Brit. Mus.; Herb. Univ. Renn.).

I have not examined the specimen (*Chevalier 20231*) originally identified by Chevalier as *Dicraeia garrettii* and cited by him in 1920, and, though not seen by the authors, accepted by Hutchinson and Dalziel in the *Flora of West Tropical Africa*.

This species is exceptional in producing two kinds of spathellae of very different appearance. The more primitive type, borne in the axils of leaves on the much-branched shoots, look when young like miniature acorns and are subtended by two linear deciduous bracts. The inner spathella containing the embryonic flower bursts through the enveloping involucel which persists at the base of the miniature inflorescence as a small cushion. On the thallus, the spathellae are remarkably characteristic and, if they had not been found in association with branches bearing the other type, would certainly have provided characters for generic separation in a family where generic distinctions are sometimes rather fine. These spathellae on the thallus of *S. heterospathella* are subtended by a scale-like, persistent, somewhat crescent-shaped bract. They are dorsally compressed with a cartilaginous ring around the margin. The developing flower bursts through the abaxial face of the spathella which becomes crateriform in appearance with an inrolled margin.

In most of the specimens of this species which I have examined, the material is either only thalloid with a few sterile branches or of fertile branches devoid of a broad thalloid base. Two specimens, however, provided evidence that the extraordinarily different spathellae, which were at first thought to belong to two distinct species, were produced on the same plant.

Chevalier referred this plant to *Dicraeanthus*, a monotypic genus of different and very distinctive habit having, among other divergent characters, linear-oblong capsule valves with 5 ribs.

FIG. 5. *Stonesia heterospathella* G. Tayl.

1. Branch with spathellae (×1½). 2. Branch with laciniate leaves (×2). 3. Spathellae with linear bracts (×20). 4. Longitudinal view of young spathella (×40). 5. Spathella shortly before anthesis (×20). 6. Young flower removed from spathella (×20). 7. Mature flower (×15). 8. Shoot and fully developed flowers (×1½). 9. Fruit (×30). 10. Persistent valve of capsule (×30).

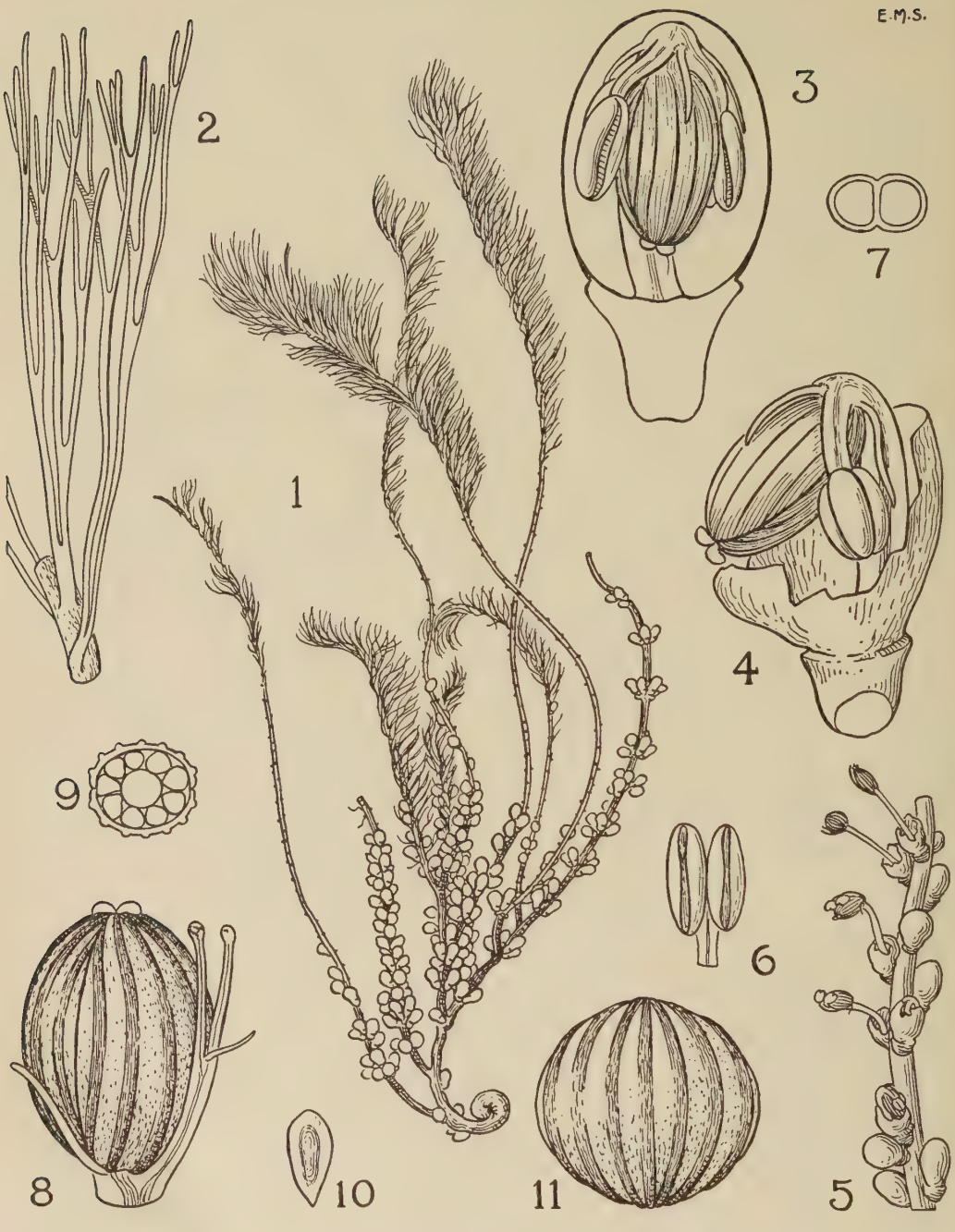

FIG. 6. *Stonesia fascicularis* G. Tayl.

1. Plant showing habit (×1). 2. Leaves (×6). 3. Flower within unruptured spathella (×20). 4. Flower emerging from spathella (×20). 5. Portion of stem with mature flowers (×2). 6. Anther (×20). 7. Pollen-grain (×400). 8. Young fruit with persistent tepals and androecium (×30). 9. Section of ovary (diagrammatic). 10. Seed (×40). 11. Persistent capsule valve (×30).

According to Chevalier's description, *S. heterospathella* forms thin crusts, from 7 to 15 cm. across, with the thallus irregularly lobed at the margin and the rounded lobes 2 cm. in diameter.

Stonesia fascicularis G. Tayl., sp. nov. (Fig. 6).

Herba caulescens, usque ad 36 cm. longa; caules elongati in parte inferiori ramosi; rami plerumque simplices, elongati, basin versus floriferi, in parte media demum efoliati sed foliorum basibus parvis persistentibus muniti, apicem versus dense foliiferi. *Folia* usque ad 15 mm. longa, 2–3-bifida, segmentis primariis anguste linearibus, segmentis ultimis capillaribus. *Spathellae* brevissime crasseque pedunculatae, ad nodos efoliatos plerumque basales fasciculares, subobovoideae, c. 2 mm. longae. *Flos* per anthesin c. 1·5 mm. altus; pedicellus c. 2 mm. longus, apice curvatus, demum erectus et usque ad 5 mm. longus. *Tepala* 0·6 mm. longa. *Staminum* filamenta c. 0·6 mm. longa; antherae 0·75 mm. longae et 0·5 mm. latae; pollen bicellulare; staminodium c. 0·5 mm. longum. *Ovarium* sessile, late ellipsoideum, 1·25 mm. longum; stigmata brevissima, c. 0·1 mm. longa, divergentia. *Capsula* late ellipsoidea, c. 14-costata; valvae c. 7-costatae, altera plerumque persistens leviter inflexa.

French Guinea. Pita, falls of the Kinkon, 880 m., on rocks in the current on the edge of the great fall, 22 Nov. 1948, *des Abbayes 897/1948* (Herb. Brit. Mus., holotype; Herb. Univ. Renn.; Herb. Utrecht).

The specific epithet derives from the characteristic clusters of spathellae at the lower nodes of the branches and, as in *S. gracilis*, these floriferous nodes become leafless. Other distinguishing features of *S. fascicularis* are the very small stigmas (only 0·1 mm. long) and the 1–3-bifid leaves which at time of flowering are confined to the uppermost parts of the stems.

Stonesia gracilis G. Tayl., sp. nov. (Fig. 7).

Herba caulescens, 22 cm. attingens; caules ex thallo radicali emergentes, graciles, simplices vel nonnunquam apicem versus parce ramosi. *Folia* ut videtur mox decidua et per anthesin tantum caulium apices versus evoluta, linearia vel filiformia, raro integra plerumque 1–2-bifida, usque ad c. 2 cm. longa. *Spathellae* ellipsoideae, ex thallo radicali emergentes etiam ad nodos approximatos secus caules singulatim vel per 2–3 dispositae, c. 2 mm. longae. *Flos* per anthesin c. 1·8 mm. altus; pedicellus c. 1·8 mm. longus, in parte superiori curvatus, demum erectus et usque ad 4 mm. longus. *Tepala* 0·8 mm. longa. *Staminum* filamenta 0·5 mm. longa; antherae 0·75 mm. longae; pollen bicellulare; staminodium 0·5 mm. longum; andropodium in spathella c. 0·5 mm., demum usque ad 1 mm. longum. *Ovarium* ellipsoideum, 1 mm. longum; stigmata brevia, filiformia, c. 0.3 mm. longa, demum divergentia. *Capsula* ellipsoidea, 14-costata; valvae 7-costatae, altera persistens leviter inflexa.

French Guinea. Great Falls (circle of Kindia), on rocks in torrents splashed by spray and covered when the water is high, 4 Nov. 1951, *des Abbayes 355/1951* (Herb. Brit. Mus., holotype; Herb. Univ. Renn.).

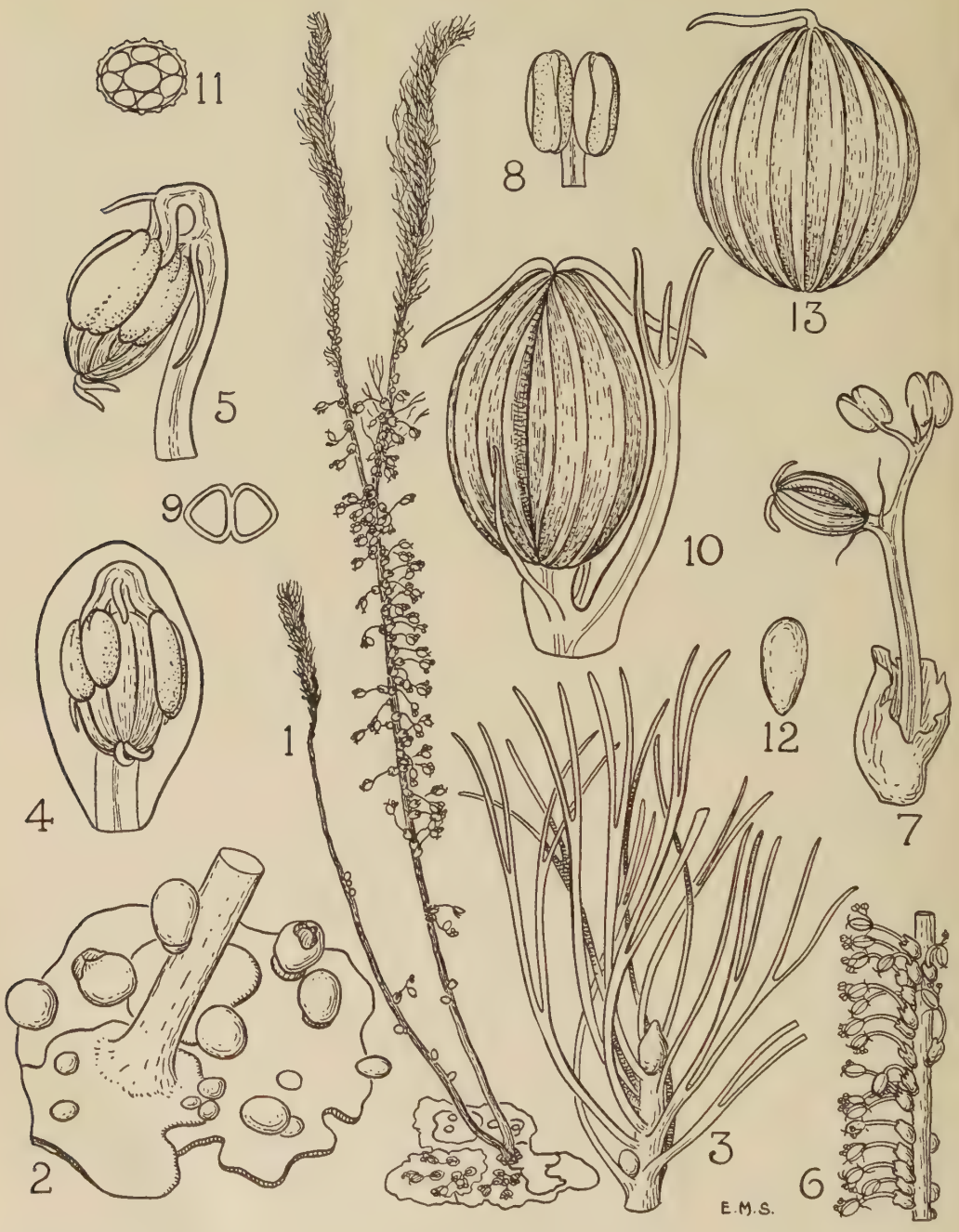

FIG. 7. *Stonesia gracilis* G. Tayl.

1. Plant showing habit (×1). 2. Thallus with base of erect stem and developing spathellae (×6). 3. Apex of stem (×6). 4. Flower within unruptured spathella (×20). 5. Flower removed from spathella (×20). 6. Portion of stem with mature flowers (×2). 7. Flower (×10). 8. Anther (×20). 9. Pollen-grain (×360). 10. Fruit with persistent tepals, androecium and stigmas (×40). 11. Section of ovary (diagrammatic). 12. Seed (×40). 13. Persistent capsule valve (×40).

This species closely resembles *S. heterospathella* in having spathellae both on the basal thallus and on elongated stems, but in the two positions the spathellae are of the same kind and not dimorphic as in the genotype. *S. gracilis* has a very distinctive habit with comparatively long slender stems which occasionally branch sparingly towards the apex and, in mature plants, have plumose tufts of entire or bifid linear leaves confined to the tops of the stems. The stems are otherwise almost bare of leaves and the flowers are usually borne singly, but sometimes in twos and threes, along the lower parts of the stems which have short internodes and apparently soon become almost leafless.

Inversodicraea abbayesii G. Tayl., sp. nov. (Fig. 8).

Herba multiramosa, ut videtur 30 cm. attingens; rami dichotomi, graciles, inferne nudi, in parte media sparse setiferi, ad apicem imbricato-foliosi strobilacei. *Folia* superiora lineari-lanceolata, integra vel 1–3-dentata sed plerumque 3-dentata dente medio longissimo subulato dentibus lateralibus parvis vel minutis, 0·5–1 mm. longa; etiam sub spathellis et in caulium furcis folia rara capillaria petiolo 1 cm. longo, lamina dichotome dissecta 2·5 cm. longa. *Spathellae* sessiles, ad caulium apices singulatim dispositae, ellipsoideae, basi foliis circumseptae, apice umbonatae, per anthesin poculiformes apice irregulariter dentatae, usque ad 3 mm. longae. *Flos* in spathella inversus; pedicellus in spathella 2·75 mm. (demum 7·5 mm.) longus. *Tepala* 2, acicularia, 0·8 mm. longa. *Stamina* 1 vel 2; filamentum in spathella c. 0·5 mm. (per anthesin 1·5 mm.) longum vel filamenta (2) 1·25 mm. longa tumque andropodio 0·75 mm. longo; antherae 1·5 mm. longae; pollen bicellulare. *Ovarium* sessile, cylindraceum vel anguste ellipsoideum, 1·5 mm. longum, leviter 8-costatum costis commissuralibus duplicibus inclusis; stigmata clavata, 0·75 mm. longa, primum antheras versus deflexa, demum decidua. *Capsula* cylindrica, bivalvis, c. 3·5 mm. longa; valvae aequales, praeter costas marginales 3-costatae.

French Guinea. Pita, falls of the Kinkon, 880 m., very abundant attached to rocks in the river below the falls, only the flowers emerging from the water, 22 Nov. 1948, *des Abbayes 898/1948* (Herb. Brit. Mus., holotype; Herb. Univ. Renn.).

Inversodicraea garrettii (C. H. Wright) G. Tayl., comb. nov.

Dicraeia garrettii C. H. Wright in Dyer, Fl. Trop. Afr. vi, 1: 126 (1909); in Hook., Ic. Pl. xxxi: t. 3042 (1915).

Inversodicraea macrothyrsa G. Tayl., sp. nov.

Saxicolella macrothyrsa A. Chev., Fl. Viv. Afr. Occ. Franç. i: 293, fig. 43A (1938), *nom. nud.* (descr. gall. tantum).

Inter species *Inversodicraeae* propter stamen unicum *I. ledermannii* proxima sed caulibus compressis efoliatis differt.

French Guinea. In branches of the River Dindia, Fouta-Djalon, *Caille* in *Herb. Chevalier 14740* (not seen).

I have been unable to examine the specimen described by Chevalier, but, from his

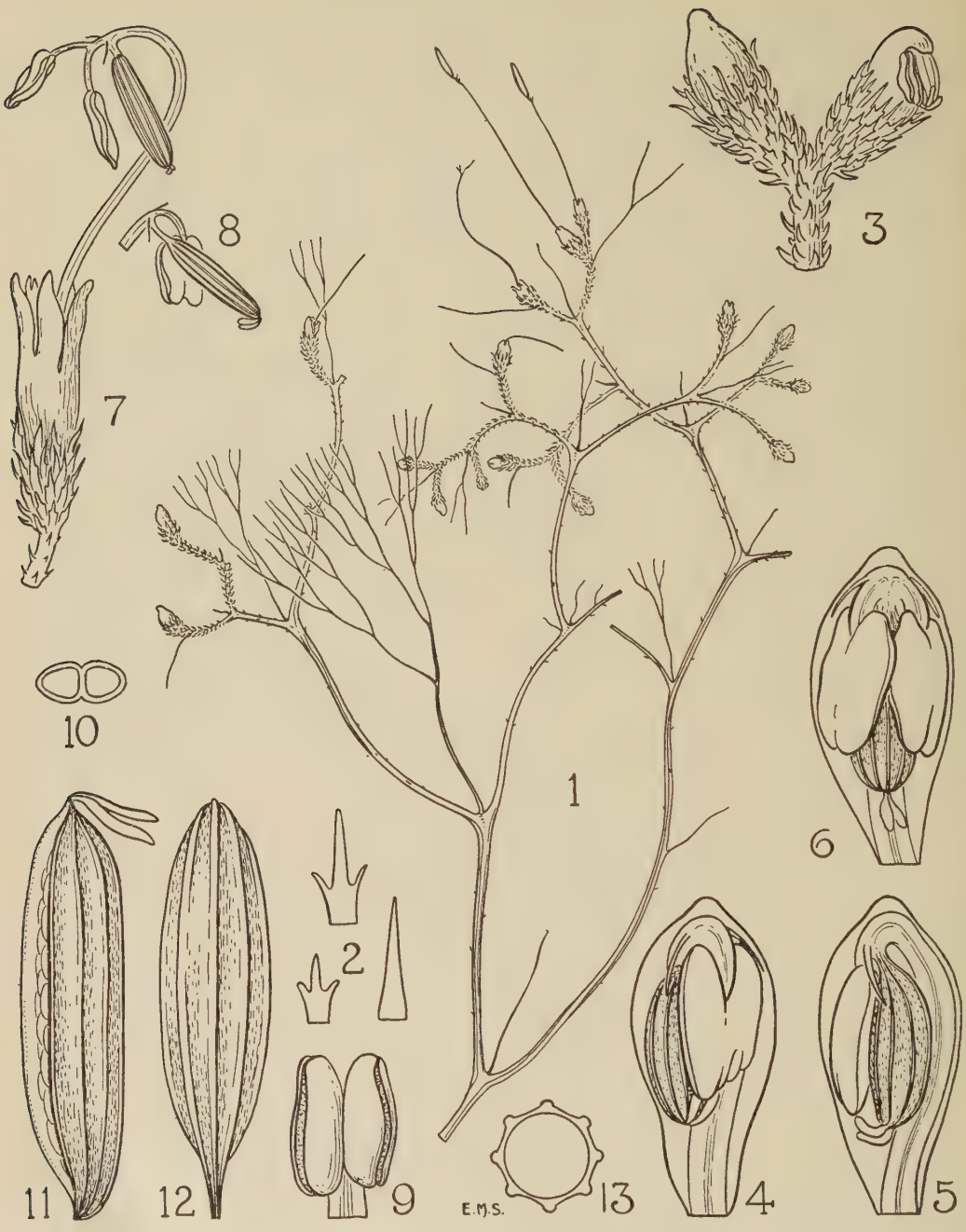

FIG. 8. *Inversodicraea abbayesii* G. Tayl.

1. Upper portion of plant (×1½). 2. Small leaves from apex of branch (×16). 3. Spathellae developing at apices of branches (×5). 4, 5, 6. Flowers within spathellae (×15). 7. Mature flower with 2 stamens (×6). 8. Flower with 1 stamen (×6). 9. Anther (×15). 10. Pollen-grain (×400). 11. Fruit (×20). 12. Capsule valve (×20). 13. Section of ovary (diagrammatic).

figures and French description, the plant cannot properly be referred to *Saxicolella*. Chevalier's illustrations clearly portray a unistaminate flower inverted within the spathella and this orientation at once excludes the species from *Saxicolella* which has an erect flower with one stamen. There are also other divergences. The plant from French Guinea is a branched caulescent herb up to 20 cm. with flattened branches and with spathellae in clusters at the ends of the leafless branches. *Saxicolella*, a local endemic in the South Cameroons, is a small plant bearing one-flowered rosulate shoots with filiform 1–3-fid leaves, about 5 mm. high, on a thallus.

Most species of *Inversodicraea* have two stamens, but in *I. pygmaea* and *I. abbayesii* unistaminate flowers occur and also in *I. ledermannii* (of which I have examined the type: *Ledermann 225* in the Berlin Herbarium) there is commonly only one, though Engler has figured the species with two. These considerations in conjunction with the other characters given by Chevalier have led me to refer his plant to *Inversodicraea*.

Inversodicraea adamesii G. Tayl., sp. nov. (Fig. 9).

Herba ramosa, 13 cm. attingens; rami dichotomi. *Folia* in caulis parte inferiori sparsa, cataphyllaria, minuta, integra vel lobata; folia superiora sub spathellis aggregata, lanceolata vel oblongo-lanceolata, integra vel lobata vel bidentata, usque ad 2 mm. longa, vel interdum bis bifida laciniis anguste ellipticis tumque usque ad 5 mm. longa. *Spathellae* 1–3 ad apicem ramulorum, anguste obovoideae, basi attenuatae, minute apiculatae, usque ad 6 mm. longae. *Flos* in spathella inversus; pedicellus in parte media flexuosus, ad apicem curvatus, c. 7 mm. longus, post anthesin erectus usque ad 2 cm. longus. *Tepala* 2, acicularia, c. 1 mm. longa. *Stamina* 2; filamenta per anthesin 2 mm. longa, andropodio 3 mm. longo; antherae 1·25 mm. longae. *Ovarium* ellipsoideum, c. 2 mm. longum, 6-costatum, costis commissuralibus inconspicuis exceptis; gynophorium 0·5 mm. longum; stigmata 2, subulata, persistentia. *Capsula* ellipsoidea, bivalvis, 3 mm. longa; valvae aequales, 3-costatae.

Portuguese Guinea. Chitale, Saltenho, 5 Feb. 1950, *Espirito Santo 2670* (Herb. Kew).

Sierra Leone. Kambia Bridge, 5 Dec. 1948, *Adames 177* (Herb. Kew, holotype).

This species, belonging to Engler's group *Tenaces*, is closely related to *I. garrettii* which is also a Sierra Leone plant, but *I. adamesii* differs in having only slightly compressed stems, capsules twice as big as those of *I. garrettii*, not compressed in the plane of dehiscence, and also in having the flowers usually solitary and not in dense clusters. The double commissural ribs on the capsule of *I. garrettii* are very prominent, so that each capsule valve has three median ribs and each margin is bordered by a half-commissural rib. In *I. adamesii* the double commissural ribs are inconspicuous and the valves are not ribbed at the margin. The new species bears a strong superficial resemblance to *I. kamerunensis* (Engl.) Engl., which is known only in the fruiting state, but this species from the Cameroons has membranous, hyaline oblong-ovate leaves aggregated towards the end of the flowering shoots.

The African *Podostemaceae*, so far as I have examined them, have cleistogamous

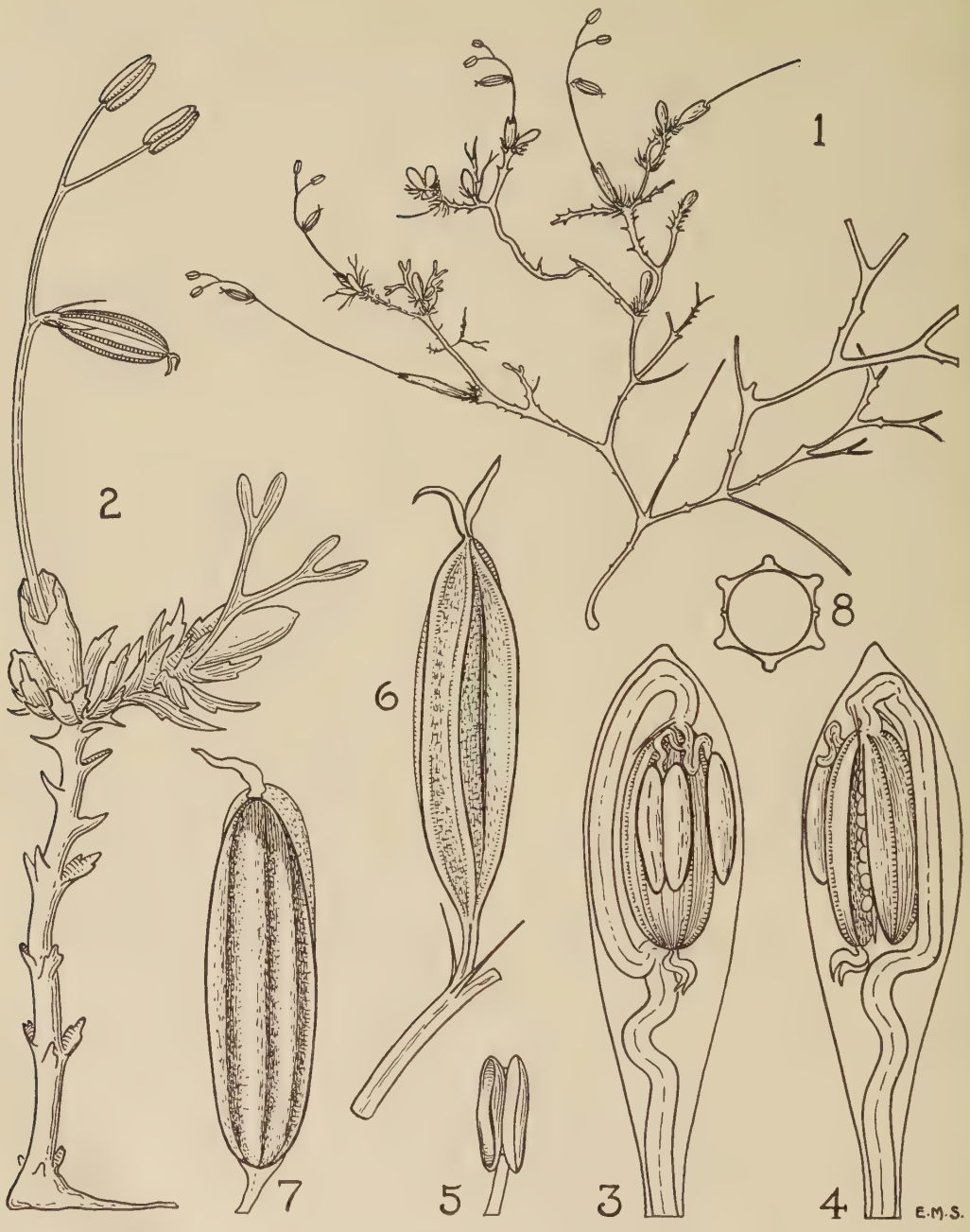

FIG. 9. *Inversodicraea adamesii* G. Tayl.

1. Plant showing habit (×1½). 2. Flowering branch (×6). 3, 4. Flowers within unruptured spathellae (×12). 5. Anther (×12). 6. Fruit (×18). 7. Capsule valve (×18). 8. Section of ovary (diagrammatic).

flowers, and in those species which produce their flowers within spathellae the fruits are ripe and full of seeds before emergence. Commonly the stamens embrace the styles and thus assist self-pollination. I have dissected several unruptured spathellae of *I. adamesii*, containing ripe seed-filled capsules, and though the anthers have already dehisced I have been unable to find any pollen. Possibly the species is apomictic.

The Santo specimen from Portuguese Guinea is in mature fruit with dehisced capsules only, but in habit and in capsule characters agrees very well with the type of *I. adamesii*.

INVERSODICRAEA LEDERMANNII (Engl.) Engl. in Engl. & Drude, Veg. Erde ix, 3, 1: 274 (1915).—A. Chev., Fl. Viv. Afr. Occ. Franç. i: 297 (1938) pro parte. (Figs. A and B).

Dicraeia ledermannii Engl., Bot. Jahrb. xliii: 381, fig. 2, g–x (1909).

IVORY COAST. At the foot of Mt. Dô, in the high Cavally, near Gouékangouiné, 750 m., 2 May 1909, *Chevalier 21421* (Herb. Paris).

The material which I have seen is very immature and, as it does not include flowering or fruiting specimens, acceptance of Chevalier's identification is based entirely on vegetative characters. In leaf-shape, the Ivory Coast plant (Fig. A) is very similar to the type plant from South Cameroons (Fig. B). Both these plants

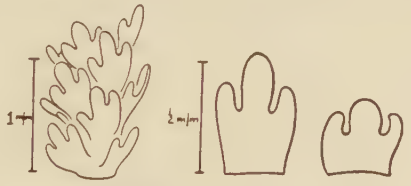

FIG. A. *Inversodicraea ledermannii* (Engl.) Engl.
Leaves from *Chevalier 21421*.

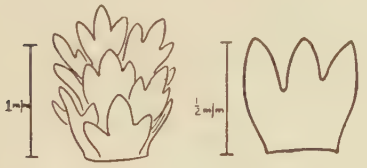

FIG. B. *Inversodicraea ledermannii* (Engl.) Engl.
Leaves from type-specimen (*Ledermann 225*).

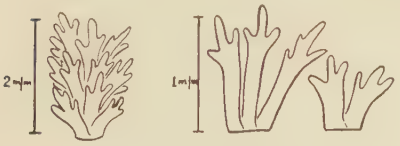

FIG. C. *Inversodicraea pygmaea* G. Tayl.
Leaves from *des Abbayes 353/1951*.

resemble *I. pygmaea* in the appearance of the densely leafy flowering shoots, but the leaves of *I. pygmaea* (Fig. C) while generally 3-dentate at the apex are linear-oblong in shape.

Inversodicraea pygmaea G. Tayl., sp. nov. (Figs. 10 and C).

Inversodicraea ledermannii sensu A. Chev., Fl. Viv. Afr. Occ. Franç. i: 297 (1938) pro parte; non Engl.

Herba pusilla, caulescens, 8–11 mm. alta (infructescentia inclusa); caules simplices, vel nonnunquam basi ramosa, ex thallo anguste fasciario emergentes. *Folia* linearioblonga, cornea, secus caules abbreviatos dense imbricata, apice plerumque 3-dentata dente medio longissimo, usque ad 1 mm. longa. *Spathellae* sessiles, ad caulium apices singulatim dispositae, obovoideae, usque ad 2 mm. longae. *Flos* in spathella inversus; pedicellus in parte superiori late curvatus, c. 2 mm. (post anthesin erectus et c. 5 mm.) longus. *Tepala* 2, acicularia, c. 0·5 mm. longa. *Stamen* 1; filamentum usque ad 1·5 mm. longum; anthera c. 0·5 mm. longa; pollen bicellulare. *Ovarium* ellipsoideum, c. 1·25 mm. longum, leviter 6-costatum costis commissuralibus inconspicuis exceptis; gynophorium c. 0·3 mm. longum; stigmata subulata, c. 0·3 mm. longa, saepe decidua. *Capsula* ellipsoidea, bivalvis, 1·5 mm. longa; valvae aequales, 3-costatae.

French Guinea. Great Falls (circle of Kindia), on flat rocks at the edge of the river at low water, amongst 'Dicraeanthus parmelioides Chev.' [probably *Stonesia gracilis*], 4 Dec. 1951, *des Abbayes 353/1951* (Herb. Brit. Mus., holotype; Herb. Univ. Renn.); same locality, 19 Dec. 1908, *Chevalier 20232* (Herb. Paris).

This plant was identified by Chevalier as *I. ledermannii*, to which it is obviously closely related and which it very much resembles. Both species have unistaminate flowers but differ considerably in habit and foliage characters. *I. pygmaea* is a dwarf plant, commonly unbranched, and at most just exceeding 1 cm. in height. *I. ledermannii* is much bigger (up to 4 cm.) and more branched. The leaves of *I. pygmaea* are narrow (linear-oblong) with a claw and narrowly 3-toothed at the apex, whereas those of *I. ledermannii* are short, broadly oblong with three broad apical teeth. Furthermore, in *I. pygmaea* the leaves are closely imbricated to the base of the stem, but in *I. ledermannii* they are more distant and scattered.

Inversodicraea tenuifolia G. Tayl., sp. nov. (Fig. 11).

Herba pusilla, acaulis, thallo radicali saxis adhaerens; gemmae sessiles, (1–)2–3-florae, in thallo irregulariter dispositae. *Folia* rosulata, sessilia, lineari-subulata, exstipulata, basi abrupte dilatata concava, usque ad 4·5 mm. longa. *Spathellae* subobovoideae, c. 2·75 mm. longae. *Flos* in spathella inversus, per anthesin c. 8 mm. altus; pedicellus leviter curvatus, c. 2·5 mm. longus, demum erectus et usque ad 8 mm. longus. *Tepala* 2, minutissima. *Stamina* 2; filamenta demum usque ad 3 mm. longa, andropodio brevi vel brevissimo; antherae 1 mm. longae et 0·75 mm. latae; pollen unicellulare. *Ovarium* ellipsoideum, c. 1·75 mm. longum et 0·8 mm. latum, tenuiter 8-costatum; gynophorium 0·5–0·75 mm. longum; stigmata 2, brevissima,

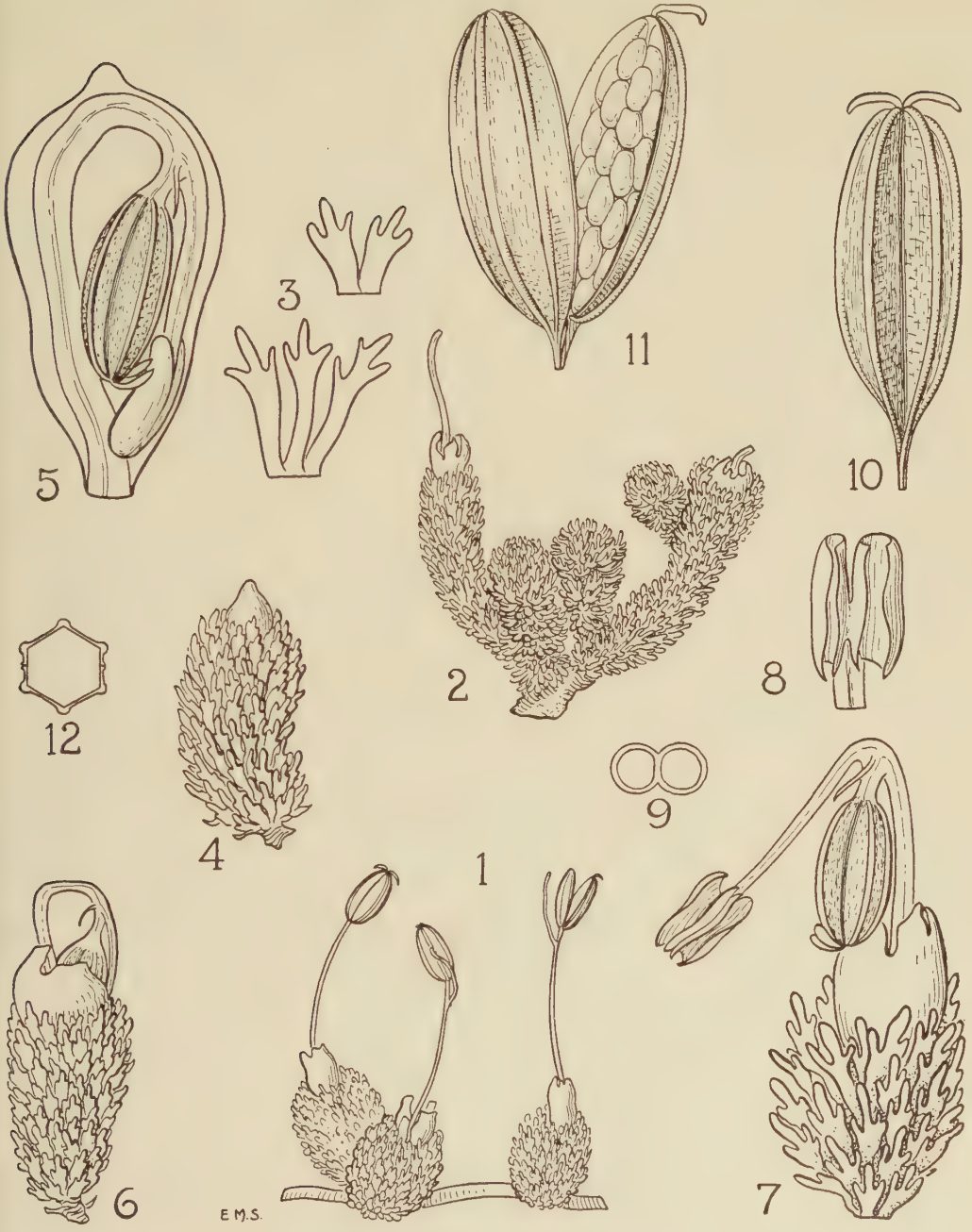

FIG. 10. *Inversodicraea pygmaea* G. Tayl.

1. Flowering shoots on narrow thallus (×6). 2. Branching flowering shoot (×6). 3. Leaves (×20). 4. Shoot with young spathella (×10). 5. Flower within unruptured spathella (×30). 6. Flower emerging from spathella (×10). 7. Young flower (×20). 8. Anther (×30). 9. Pollen-grain (×400). 10. Fruit (×30). 11. Dehisced fruit (×30). 12. Section of ovary (diagrammatic).

FIG. 11. *Inversodicraea tenuifolia* G. Tayl.

1. Plant showing habit (×3). 2. Leaf (×15). 3. Flowering shoot (×10). 4. Shoot with young fruit (×10). 5, 6. Flowers within unruptured spathellae (×20). 7. Anther (×20). 8. Pollen-grain (×100). 9. Young capsule with persistent tepals and androecium (×20). 10. Section of ovary (diagrammatic). 11. Dehisced capsule (×20). 12. Capsule valve (×20).

crassa, patentia, persistentia. *Capsula* ellipsoidea, bivalvis, 2 mm. longa; valvae aequales, praeter costas marginales 3-costatae.

NIGERIA. Ogoja Province: on the Boje–Aboabam path crossing the Afi River, aquatic herb on rocks, 13 Dec. 1950, *Keay FHI. 28241* (Herb. Kew, holotype; Herb. Brit. Mus.).

This species is distinguished by its 2–3- (rarely 1-) flowered shoots borne on a thallus, and by having rosulate linear-lanceolate leaves.

Inversodicraea musciformis G. Tayl., sp. nov. (Fig. 12).

Herba caulescens, 2 cm. attingens; caules ramosi. *Folia* in caulis parte inferiori cataphyllaria, minuta, acicularia vel linearia; folia superiora sub spathellis aggregata, disticha, lineari-subulata, basi gradatim dilatata et concava, subamplexicaulia, exstipulata, usque ad 14 mm. longa. *Spathellae* caulis apicem versus dispositae, ramulos terminantes, ovoideae, apice umbonatae, c. 2·75 mm. longae. *Flos* in spathella inversus; pedicellus curvatus, c. 2 mm. longus, post anthesin erectus usque ad c. 8 mm. longus. *Tepala* 2, acicularia, 0·6 mm. longa. *Stamina* 2; filamenta c. 0·8 mm. longa, andropodio c. 0·5 mm. longo; antherae 0·75 mm. longae et 0·7 mm. latae, accumbentes; pollen unicellulare. *Ovarium* ellipsoideum vel obovoideum, 1·75 mm. longum tenuiter 8-costatum; gynophorium brevissimum; stigmata 2, botuliformia, 1 mm. longa, in spathella antheras versus deflexa, persistentia. *Capsula* ellipsoidea, bivalvis, 1·75 mm. longa; valvae aequales, praeter costas marginales 3-costatae, altera persistens, altera decidua.

BRITISH CAMEROONS. Bamenda Province: north-west slopes of Mba Kokeka Mt., 2,300 m., moss-like herb anchored to wet rock, 3 Jan. 1951, *Keay FHI. 28542* (Herb. Kew, holotype; Herb. Brit. Mus.).

The distichous linear-subulate leaves aggregated at the apex of abbreviated 1-flowered branchlets, the conspicuous clavate stigmas and the branching habit are sufficient to distinguish this species.

Inversodicraea variabilis G. Tayl., sp. nov. (Fig. 13).

Herba pusilla, caulescens, usque ad 8·5 mm. alta; caules simplices ex thallo radicali emergentes. *Folia* sessilia, disticha, stipulata vel simulate exstipulata, basi vaginata, cornea, in caulis parte inferiori cataphyllaria; folia superiora bifida vel bis bifida, laciniis anguste linearibus, usque ad 7·5 mm. longa. *Spathellae* 1–2(–7) ad caulium apices, ellipsoideae vel subovoideae, basi attenuatae stipitatae, apice breviter umbonatae, usque ad 3·25 mm. longae. *Flos* in spathella inversus; pedicellus in parte superiori curvatus, c. 3·25 mm. (post anthesin 4 mm.) longus. *Tepala* 2, acicularia, c. 0·5 mm. longa. *Stamina* plerumque 2 sed interdum 3 vel raro 4; filamenta per anthesin c. 1 mm. ad c. 3·5 mm. longa, andropodio subnullo vel crasso usque ad 1 mm. longo; antherae 1 mm. longae et 1 mm. latae, accumbentes; pollen bicellulare. *Ovarium* ellipsoideum, c. 1·5 mm. longum, leviter 8-costatum; gynophorium brevissimum; stigmata forma variantia, brevissima, clavata vel flabellata et complanata tumque apice 2–3-lobata, persistentia. *Capsula* ellipsoidea, bivalvis, 1·5 mm. longa; valvae aequales, praeter costas marginales 3-costatae.

FIG. 12. *Inversodicraea musciformis* G. Tayl.

1. Flowering plant (×2). 2. Flowering shoot (×10). 3, 4. Flowers within unruptured spathellae (×20). 5. Mature flower (×20). 6. Pollen-grain (×150). 7. Dehisced capsule (×20). 8. Capsule valve with persistent stigmas (×20).

FIG. 13. *Inversodicraea variabilis* G. Tayl.

1. Plant showing habit (×4). 2. Leaf (×10). 3, 3*a*. Leaf bases (×20). 4. Shoot with young spathella (×10). 5,6. Flowers within unruptured spathellae (×15). 7. Shoot with mature flower (×10). 8. Flower (×10). 9. Anther (×20). 10. Pollen-grain (×360). 11, 11*a*. Flowers showing variation in androecium (×10). 12. Variation of stigmas (×40). 13. Section of ovary (diagrammatic). 14. Dehisced capsule (×20). 15. Capsule valve (×20).

British Cameroons. Mamfe District: by Ikom–Mamfe road ferry, River Mun Aiya, on flat rock at water's edge, firmly fixed to rock at water-level in falling river, 20 Jan. 1951, *Keay FHI. 28688* (Herb. Kew, holotype; Herb. Brit. Mus.).

The unbranched flowering shoots with distichous leaves (the upper lobed) bearing stipitate spathellae at the apex are sufficient to differentiate this new species. I have placed this plant in *Inversodicraea* mainly because the flower is inverted within the spathella and the stamens are most commonly two. As the specific epithet implies, *I. variabilis* is extremely plastic and the variability of several characters which it displays would normally transcend generic limits. The leaves may be distinctly stipulate or stipules may be absent and the wide variation in the androecium and in the shape of the stigmas is particularly noteworthy.

Inversodicraea keayi G. Tayl., sp. nov. (Fig. 14).

Herba caulescens, 6 cm. attingens; caules ex thallo radicali emergentes, inferne nudi, superne ramosi; ramuli interdum laxe dispositi sed plerumque ad caulis apicem congesti. *Folia* sessilia, disticha, aliquantulum navicularia, exstipulata, in ramos abbreviatos floriferos aggregata, usque ad 2 mm. longa. *Spathellae* solitariae, ramulos terminantes, ovoideae vel globosae vel late ellipsoideae, apiculatae vel umbonatae, c. 2·5 mm. longae. *Flos* in spathella breviter pedicellatus, inversus; pedicellus curvatus, c. 2 mm. longus, demum erectus et 3 mm. longus. *Tepala* 2, minutissima. *Stamina* 2; filamenta c. 0·5 mm. longa andropodio aequilonga; antherae 0·75 mm. longae et c. 0·5 mm. latae, accumbentes; pollen unicellulare. *Ovarium* late ellipsoideum, 1·5 mm. longum et 1 mm. latum, tenuiter 8-nervium; gynophorium c. 0·5 mm. longum; stigmata 2, botuliformia, c. 0·5 mm. longa, antheras versus deflexa. *Capsula* ellipsoidea, bivalvis, 1·5 mm. longa; valvae aequales, praeter costas marginales leviter 3-costatae, altera persistens, altera decidua.

British Cameroons. Bamenda Province: Banso, 1,650 m., on rocks at water-level in small stream, 5 Jan. 1951, *Keay FHI. 28457* (Herb. Kew, holotype; Herb. Brit. Mus.); near Sagbo, Ndop, 1,800 m., on steep granite cliff-face under dripping water, 20 Dec. 1952, *Adams 11073* (Herb. Brit. Mus.).

This is one of a group of species of *Inversodicraea* in which the leaves on the flowering shoots are closely imbricated and arranged distichously. *I. keayi* is characterized by having the dwarf flowering branches aggregated in heads or clusters.

E.M.S.

FIG. 14. *Inversodicraea keayi* G. Tayl.

1. Plant showing habit (×2). 2. Plant with young spathellae terminating short branches (×2). 3. Cluster of flowering branches (×6). 4. Single flowering shoot (×16). 5. Leaf (×16). 6, 7. Flowers within unruptured spathellae (×16). 8. Stamens (×24). 9. Pollen-grain (×180). 10. Flowering shoot at maturity (×16). 11. Dehisced capsule (×24). 12. Persistent capsule valve (×24).

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